

Claims

1. An apparatus for detecting a pressure in a cylinder of an internal combustion engine, said apparatus comprising:

an annular shell extending along a longitudinal axis, said shell being configured for removable attachment to said engine such that a portion of said
5 shell is subjected to the pressure in said cylinder;

a pressure sense assembly affixed to said shell, said assembly having a base plate, said base plate having a body portion, said base plate being affixed to said shell, said assembly including at least one strain gauge formed thereon.

2. The apparatus of claim 1 wherein said body portion has first and second tabs extending axially away from said body portion, said first and second tabs of said base plate being affixed to said shell.

3. The apparatus of claim 2 wherein said apparatus comprises a spark plug and said engine comprises a spark ignition internal combustion engine.

4. The apparatus of claim 1 wherein said apparatus comprises a glow plug and said engine comprises a diesel cycle internal combustion engine.

5. The apparatus of claim 3 further including a central electrode coaxial with and surrounded by said annular shell, said electrode having a first end configured for connection to a relatively high voltage source and a second, exposed end opposite said first end, an insulator outwardly of said central electrode, said shell
5 being radially outwardly of said insulator and electrically conductive, a second electrode spaced apart from said second end of said central electrode to define a spark gap there between, said second electrode being electrically connected to said shell.

6. The apparatus of claim 5 further including a second longitudinal axis generally parallel to and offset from said first longitudinal axis extending through said base plate through said first and second tabs, wherein said at least one strain gauge being disposed on a first side of said second longitudinal axis and a second strain gauge being disposed on a second side of said second longitudinal axis opposite said first side, said first and second strain gauges being configured to detect an axial strain of said shell.

7. The apparatus of claim 6 wherein said pressure sense assembly further includes third and fourth strain gauges formed on said base plate on opposing sides of said second longitudinal axis.

8. The apparatus of claim 7 wherein said base plate is unattached to said shell other than at said first and second tabs, wherein said third and fourth strain gauges are disposed circumferentially outwardly of an area of said base plate subtended in an axial direction by said first and second tabs.

9. The apparatus of claim 7 wherein said base plate is unattached to said shell other than at said first and second tabs, wherein said third and fourth strain gauges are disposed circumferentially outwardly of an area of said base plate subtended in an axial direction by said first and second tabs.

10. The apparatus of claim 9 wherein said base plate comprises stainless steel material.

11. The apparatus of claim 10 wherein said pressure signal is configured for transmission to a controller that is coupled to said bridge circuit and which is configured to process said pressure signal.

12. The apparatus of claim 5 further including an ignition coil coupled to said first end of said central conductor configured to generate said relatively high voltage.

13. The apparatus of claim 1 wherein said base plate is curved.

14. The apparatus of claim 1 wherein said base plate includes a hole.

15. The apparatus of claim 1 wherein said shell includes a flat region, said base plate being planar.

16. A spark generating assembly for initiating combustion and detecting a pressure in a cylinder of an internal combustion engine, said assembly comprising:

5 a central electrode having a main axis and a first end configured for connection to a relatively high voltage source;

an insulator radially outwardly of said central electrode, said central electrode further having a second, exposed end axially opposite said first end;

10 an annular shell extending along said main axis, said shell being configured for removable attachment to said engine such that a portion of said shell is subjected to the pressure in said cylinder;

a second electrode spaced apart from said second end of said central electrode to define a spark gap there between, said second electrode being electrically coupled to said shell; and

15 a pressure sense assembly affixed to said shell, said pressure sense assembly having a base plate, said base plate having a central body portion said plate being affixed to said shell, said assembly including at least one strain gauge formed thereon.

17. The assembly of claim 16 wherein said central body portion has first and second opposing tabs extending axially away from said central body portion, said first and second tabs being affixed to said shell.

18. The assembly of claim 17 further including a second longitudinal axis generally parallel to and offset from said first longitudinal axis extending through said base plate through said first and second tabs, wherein said at least one strain gauge being disposed on a first side of said second longitudinal axis and a second strain gauge being disposed on a second side of said second longitudinal axis opposite said first side, said first and second strain gauges being configured to detect an axial strain of said shell.

19. The assembly of claim 18 wherein said pressure sense assembly further includes third and fourth strain gauges formed on said base plate on opposing sides of said second longitudinal axis.

20. The assembly of claim 19 wherein said base plate is unattached to said shell other than at said first and second tabs, wherein said third and fourth strain gauges are disposed circumferentially outwardly of an area of said base plate subtended in an axial direction by said first and second tabs.

21. The assembly of claim 20 further comprising a bridge circuit electrically connected to said first, second, third and fourth strain gauges configured to generate a pressure signal indicative of said pressure in said combustion cylinder of said internal combustion engine.

22. The assembly of claim 21 wherein said base plate comprises stainless steel material.

23. The assembly of claim 22 wherein said pressure signal is configured for transmission to a controller that is coupled to said bridge circuit and which is configured to process said pressure signal.

24. The assembly of claim 23 further including an ignition coil coupled to said first end of said central conductor configured to generate said relatively high voltage.

25. The assembly of claim 24 wherein said base plate is planar, said shell including a flat region configured to receive said base plate.